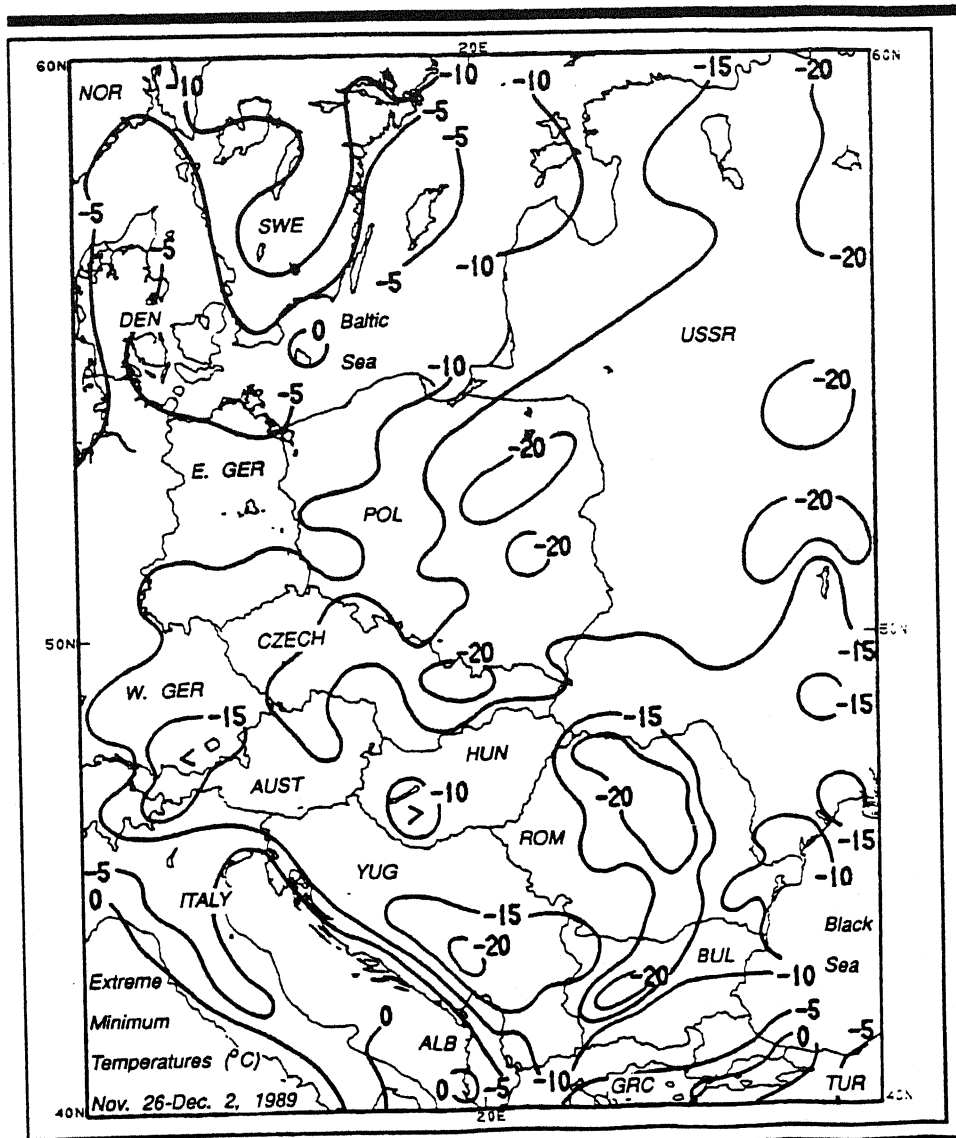
CLIMATE ANALYSIS CENTER

CONTAINS:
NOVEMBER '89
UNITED
STATES
CLIMATE
SUMMARY

WEEKLY CLIMATE BULLETIN

No. 89/48 Washington, DC December 2, 1989



AFTER EXPERIENCING SEVERAL WARM SPELLS IN EUROPE THIS YEAR, THE MOST RECENT ONE OCCURRING DURING MID-OCTOBER THROUGH MID-NOVEMBER, AN EXTREMELY COLD AIR MASS COVERED THE EASTERN THREE-QUARTERS OF THE CONTINENT LAST WEEK. TEMPERATURES DROPPED TO UNDER -20°C IN PORTIONS OF EASTERN EUROPE AND THE EUROPEAN SOVIET UNION, AND WEEKLY TEMPERATURES AVERA AS MUCH AS 11°C I NORMAL IN SECTIC YUGOSLAVIA AND RC THE ADDITIVE EFFI GUSTY WINDS CR DANGEROUS WIND BETWEEN -20°C ANI ACROSS MUCH OF TH

UNITED STATES DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL WEATHER SERVICE - NATIONAL METEOROLOGICAL CENTER

CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- Highlights of major climatic events and anomalies.
- U.S. climatic conditions for the previous week.
- U.S. apparent temperatures (summer) or wind chill (winter).
- U.S. cooling degree days (summer) or heating degree days (winter).
- Global two-week temperature anomalies.
- Global four-week precipitation anomalies.
- Global monthly temperature and precipitation anomalies.
- Global three-month precipitation anomalies (once a month).
- Global twelve-month precipitation anomalies (every three months).
- Global three-month temperature anomalies for winter and summer seasons.
- Special climate summaries, explanations, etc. (as appropriate).

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR EVENTS AND ANOMALIES AS OF DECEMBER 2, 1989

1. Northern and Eastern Canada and New England:

COLD AIR CONTINUES ITS SOUTHEASTWARD SLIDE.

The core of the Arctic air mass moved over southeastern Canada where temperatures were as much as 10°C below normal. By late in the week, the cold air had pushed into New England, dropping minimum temperatures to record low levels [5 weeks].

2. Kansas, Missouri, and Oklahoma:

MOISTURE SHORTAGES PREVAIL.

Portions of the Great Plains remained parched as dry conditions continued to dominate the area. The prolonged dry spell has adversely affected river levels and yielded the lowest monthly total ever at Kansas City where only a trace of precipitation was recorded during November [11 weeks].

3. Spain:

WARM AND WET CONDITIONS PERSIST.

Heavy rains continued to fall across southern and eastern Spain where nearly 155 mm was observed [4 weeks]. Meanwhile, northern and extreme eastern Spain remained unusually warm as temperatures averaged nearly 6°C above normal [7 weeks].

4. Eastern Europe, Western U.S.S.R., and Middle East:

BITTER COLD ENVELOPES REGION.

A winter storm which brought heavy snows to portions o Turkey also disrupted the Malta Summit as strong winds behinc the system whipped the Mediterranean Sea. These winds ushered in cold air across Eastern Europe and the European U.S.S.R., dropping average temperatures to as much as 11°C below normal (see Front Cover) [2 weeks].

5. South Africa:

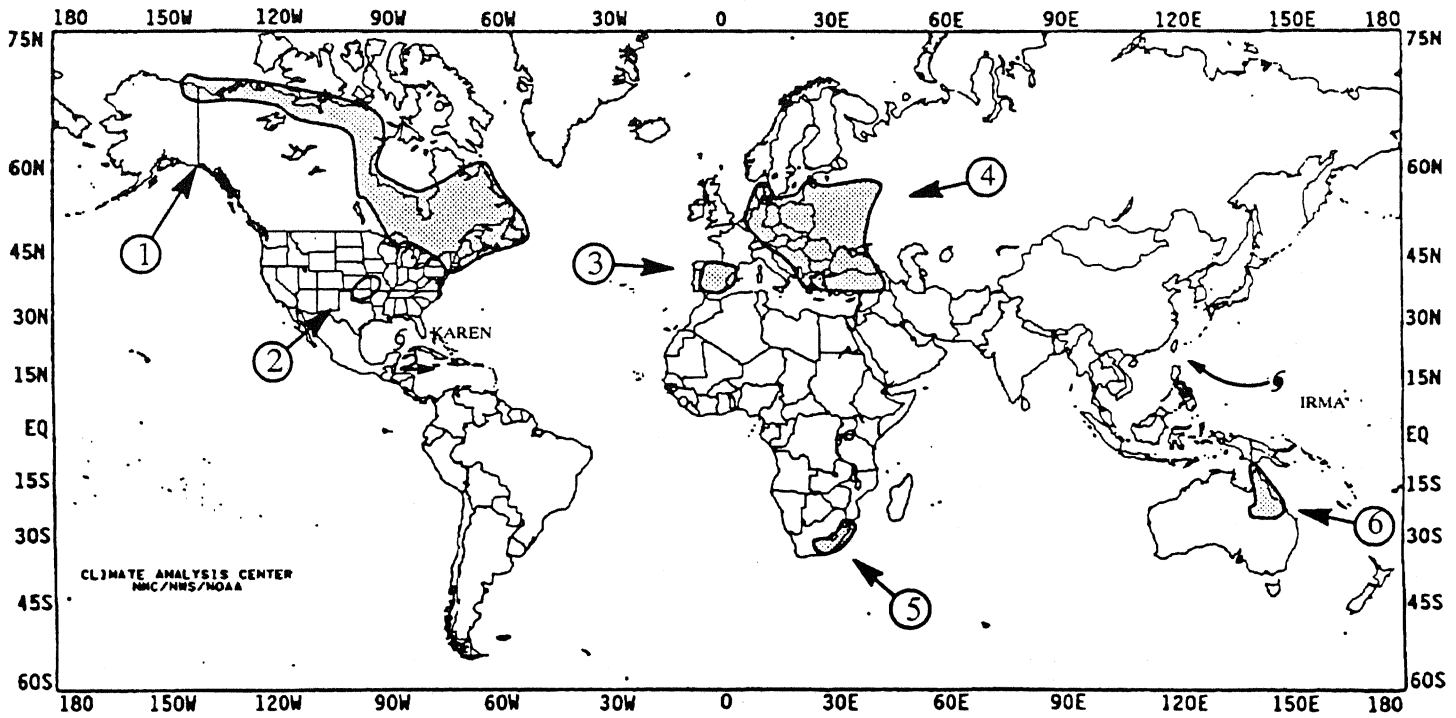
EXCESSIVE WETNESS DEVELOPS.

Abundant moisture became evident over southern and eastern parts of the country following a November that was the wettes since 1967. Weekly accumulations approached 312 mm with as much as 177 mm of that total falling in less than 24 hours [5 weeks].

6. Northeastern Australia:

PRECIPITATION REMAINS PLENTIFUL.

Widespread rainfall continued across much of Queensland where totals approached 115 mm. Even the more arid portions of the state have noted the abnormal precipitation as November accumulations were nearly 942% of normal [5 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF NOVEMBER 26 THROUGH DECEMBER 2, 1989

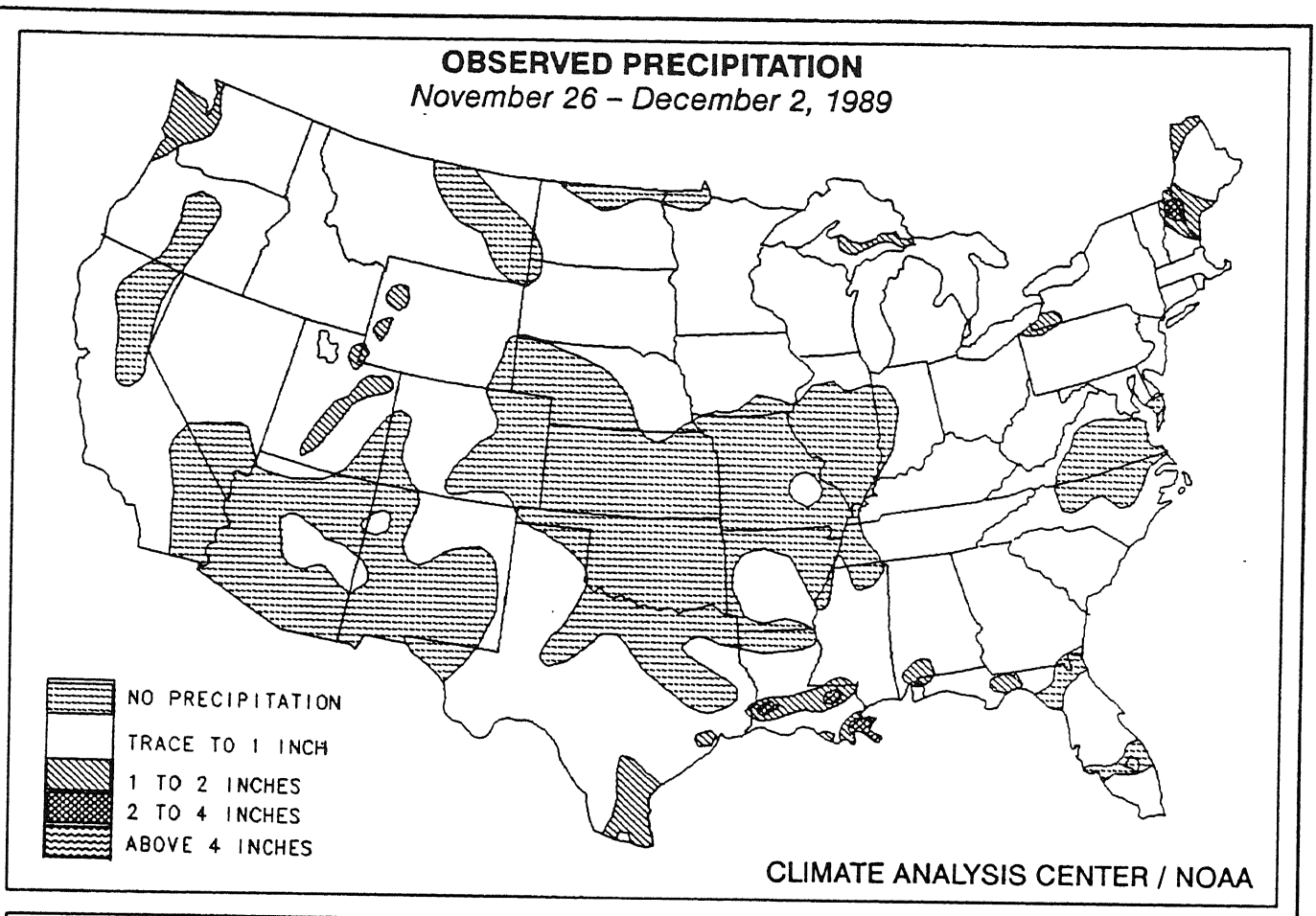
Three winter storms generated most of the significant weather across the eastern two-thirds of the U.S. As the week commenced, the first system was churning in the central High Plains, accompanied by a trailing cold front which extended southward from the storm's center to the Big Bend of Texas. To the north and west of the system, snow fell at varying rates across the northern halves of the Rockies, Intermountain West, and Sierra Nevadas. More than three feet of snow accumulated in some California mountain passes before the system moved rapidly northeastward through the Great Lakes and up the St. Lawrence Seaway by Tuesday evening. Six to twelve inches of snow blanketed parts of the northern Plains, Great Lakes, and northern New England while only scattered light rain showers accompanied the trailing cold front as it raced through the southern three-fourths of the East. Twenty-three daily record highs were set throughout the East on Monday, but the cold front ushered in very cold and dry air on brisk northwesterly winds. As these winds blew across the relatively warm waters of the Great Lakes, another round of lake-effect snows buried parts of the Michigan Upper Peninsula with nearly two feet while other snow belt areas recorded five to ten inches. With cold, dry air entrenched across the East, the second wintry system of the week came in the form of a weak Alberta clipper which brushed New England around midweek. Just a couple of inches of snow fell on Maine, but the storm veered the northwesterly winds that were generating the lake-effect snows and temporarily ended the episode. Late in the week, a much stronger Alberta clipper intensified over the Great Lakes and moved off the southeast New England Coast, drawing warm air up from the South to temporarily end the frigid conditions across the East. Only light snow accompanied the system in the Great Lakes and Appalachians, but much heavier amounts of snow and freezing rain fell across New England as the system tapped Atlantic Ocean moisture. Nearly a foot of snow was measured in eastern Maine Saturday evening, and heavy snow continued to fall. Furthermore, the storm brought additional cold air into the East behind it and set up another round of heavy lake-effect snows for the Great Lakes and Appalachians. Farther west, the dry pattern which has developed across the Far West, Rockies, and Plains was briefly interrupted by the early-week winter storm and by a weak system which dropped light rain along the Pacific Northwest Coast. In Alaska, above normal temperatures accompanied heavy rains along the southern coastal sections while cold and dry conditions persisted farther north. Seasonable temperatures and exceptionally dry weather continued in Hawaii as subnormal precipitation was recorded for the fifth consecutive week. Tropical Storm Karen, an unusually late-season storm, formed in the northern Caribbean Sea just as the 1989 hurricane season officially ended. The slowly and erratically drifting storm inundated parts of western Cuba with over a foot of rain before moving southward.

According to the River Forecast Centers, dry weather dominated the country as heavy precipitation was a rarity across the contiguous U.S. The greatest weekly totals (more than 7 inches) were reported along the coasts of south-central and southeastern Alaska (see Table 1). In the lower 48 states, only a few scattered stations in southern Texas, the central Gulf Coast, and the western Florida peninsula observed more than two inches of precipitation. Light to moderate amounts occurred in the northern halves of the Pacific Coast, Intermountain West, and Rockies, in sections of central and southern California, in the southern and north-central Great Plains, throughout the upper Midwest, Great Lakes, Northeast, and much of the Appalachians, and across the Gulf Coast states. Little or no precipitation fell on the southern halves of the Intermountain West and Rockies, the extreme northern and the south-central Great Plains, the lower and middle Mississippi Valleys, and in the south-central Atlantic Coast states. The precipitation received in the central Rockies and the southern portions of Texas and Florida was welcome as it brought some relief from the regions' long-term dryness. In contrast, exceedingly dry weather since mid-September across much of the Plains has hindered winter wheat growth and fueled concerns about moisture shortages. Additionally, very low river levels on the Missouri and Mississippi Rivers have caused navigation problems for barge traffic.

Very cold weather dominated the Northeast for the second consecutive week (see Table 3). The greatest negative departures (between -7°F and -15°F) were observed across northern and western New England, while temperatures averaged 10°F to 16°F below normal throughout the northern half of Alaska. Departures were less extreme in the upper Midwest, but it marked the area's third successive week with subnormal temperatures. Elsewhere, slightly colder than usual conditions were found throughout most of the West, in sections of the Plains, and across the Great Lakes and the Northeast. Readings in the northern Great Plains, upper Midwest, and New England dipped below zero during the peak of the two consecutive wintry blasts, and freezing temperatures were recorded southward to the southern Atlantic and Gulf Coasts. In addition, gusty winds accompanying the cold air sent wind chills below -30°F in parts of the northern tier of states. In contrast, unseasonably mild weather was reported in the northern High Plains due to mild Chinook winds while two brief warm spells kept temperatures above normal across the Southeast. In both areas, temperatures generally averaged 2°F to 5°F above normal. Farther north, departures of +3°F to +9°F were observed throughout southern Alaska (see Table 2). Highs above 80°F were limited to the Deep South (see Figure 1).

TABLE 1. Selected stations with 2.00 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
KETCHIKAN, AK	7.45	KODIAK, AK	2.57
ANNETTE ISLAND, AK	5.79	SITKA, AK	2.24
YAKUTAT, AK	5.09	NEW ORLEANS NAS, LA	2.16
MT. WASHINGTON, NH	3.15	BEEVILLE NAS, TX	2.02
CORDOVA/MILE 13, AK	3.00	MCALLEN, TX	2.02


OBSERVED PRECIPITATION
November 26 – December 2, 1989
NO PRECIPITATION
TRACE TO 1 INCH
1 TO 2 INCHES
2 TO 4 INCHES
ABOVE 4 INCHES
CLIMATE ANALYSIS CENTER / NOAA

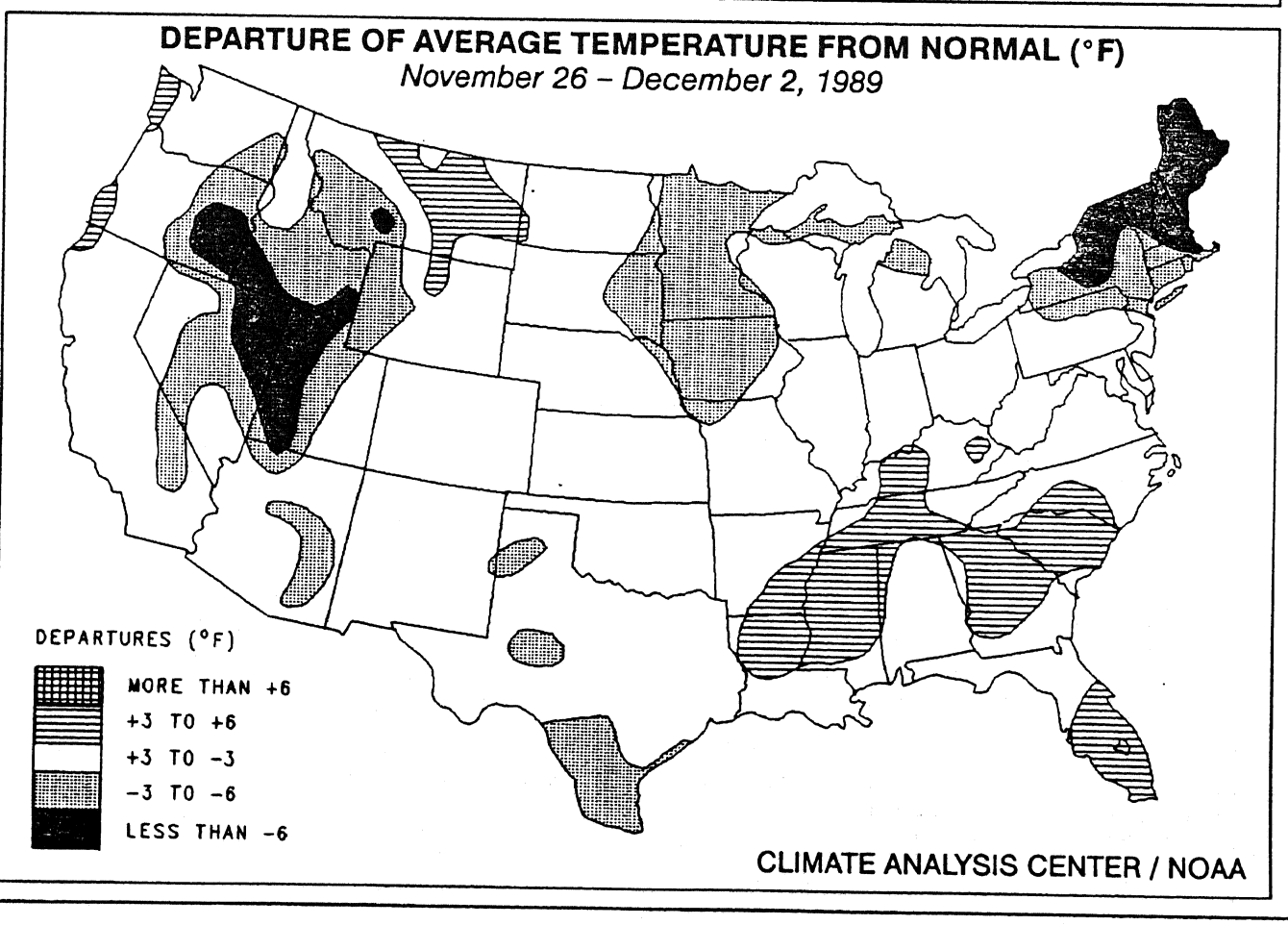

DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)
November 26 – December 2, 1989
DEPARTURES (°F)
MORE THAN +6
+3 TO +6
+3 TO -3
-3 TO -6
LESS THAN -6
CLIMATE ANALYSIS CENTER / NOAA

TABLE 2. Selected stations with temperatures averaging 4.0°F or more ABOVE normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
KENAI, AK	+8.3	24.8	COLUMBIA, SC	+4.5	54.6
CORDOVA/MILE 13, AK	+7.7	34.5	JACKSON, MS	+4.4	55.6
SITKA, AK	+6.7	41.4	ATLANTA, GA	+4.4	52.3
TALKEETNA, AK	+6.1	18.9	AUGUSTA, GA	+4.3	54.5
JUNEAU, AK	+5.4	35.1	LEWISTOWN, MT	+4.3	31.9
WORLAND, WY	+5.4	30.0	HOMER, AK	+4.3	29.8
ANNETTE ISLAND, AK	+5.1	42.6	KETCHIKAN, AK	+4.2	41.8
VALDEZ, AK	+5.1	27.2	ALBANY, GA	+4.1	57.3
MONROE, LA	+4.7	55.7	MACON/WARNER-ROBINS AFB, GA	+4.1	55.0
CHATTANOOGA, TN	+4.7	49.6	QUILLAYUTE, WA	+4.1	46.5
CUT BANK, MT	+4.7	29.4	YAKUTAT, AK	+4.1	33.6
MILES CITY, MT	+4.6	30.9	ILIAMNA, AK	+4.1	22.3
MONTGOMERY/MAXWELL AFB, AL	+4.5	55.4			

TABLE 3. Selected stations with temperatures averaging 7.0°F or more BELOW normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
BARTER ISLAND, AK	-16.0	-22.4	BURLINGTON, VT	-9.0	21.3
BETHEL, AK	-15.8	-4.4	IDAHO FALLS, ID	-8.9	18.2
HOULTON, ME	-14.5	10.7	ELKO, NV	-8.8	21.4
CARIBOU, ME	-14.1	10.0	BARROW, AK	-8.6	-15.9
MT. WASHINGTON, NH	-13.5	1.6	UTICA, NY	-8.1	24.3
ANIAK, AK	-12.2	-5.3	LEBANON, NH	-7.9	21.8
BANGOR, ME	-11.3	19.1	WORCESTER, MA	-7.9	25.7
MASSENA, NY	-10.8	17.7	SYRACUSE, NY	-7.6	27.3
MONTPELIER, VT	-10.4	17.6	ROME/GRIFFISS AFB, NY	-7.5	25.0
AUGUSTA, ME	-10.3	20.9	CONCORD, NH	-7.4	23.8
FAIRBANKS, AK	-9.7	-13.6	BOSTON/LOGAN, MA	-7.4	32.1
BURNS, OR	-9.4	21.4	PORTLAND, ME	-7.1	25.5
KOTZEBUE, AK	-9.2	-7.4	CEDAR CITY, UT	-7.0	27.4

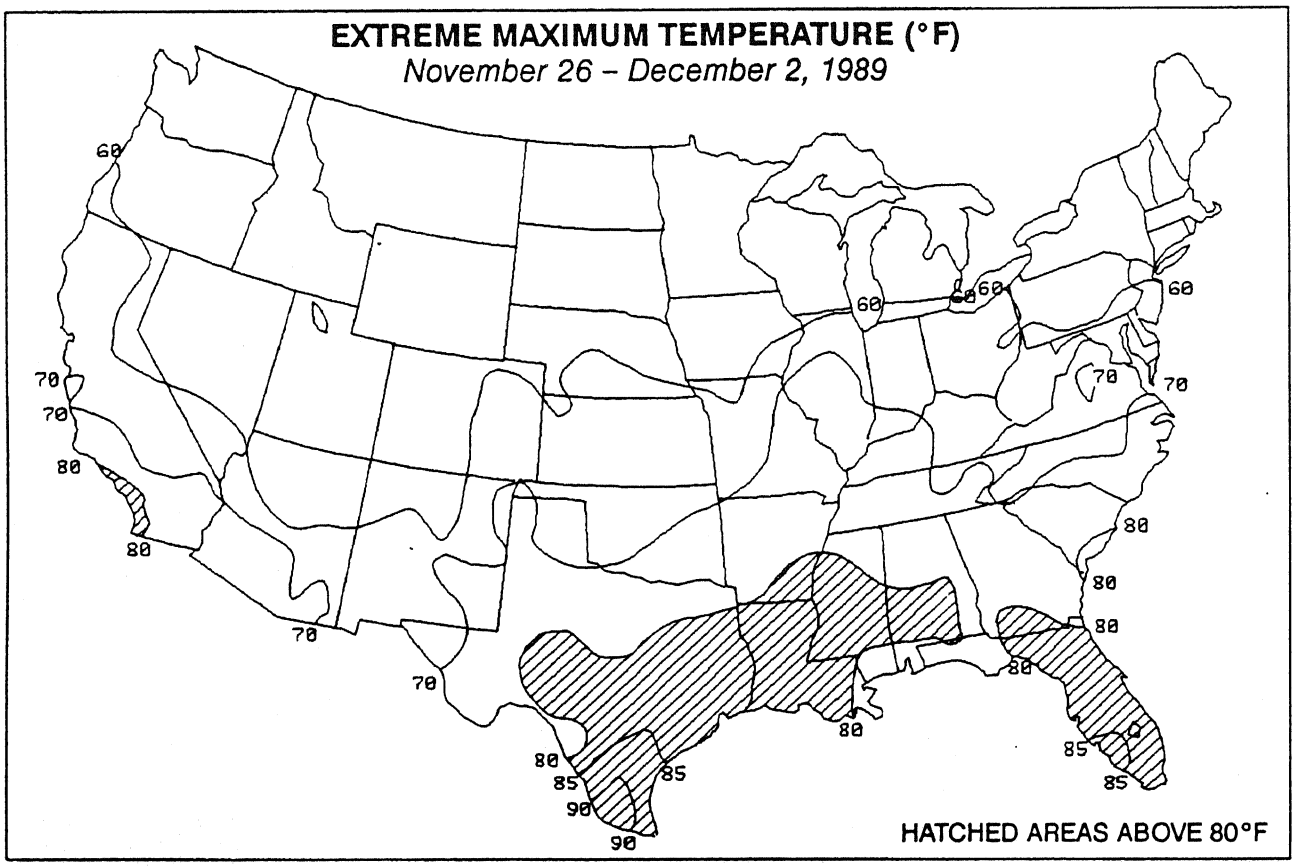
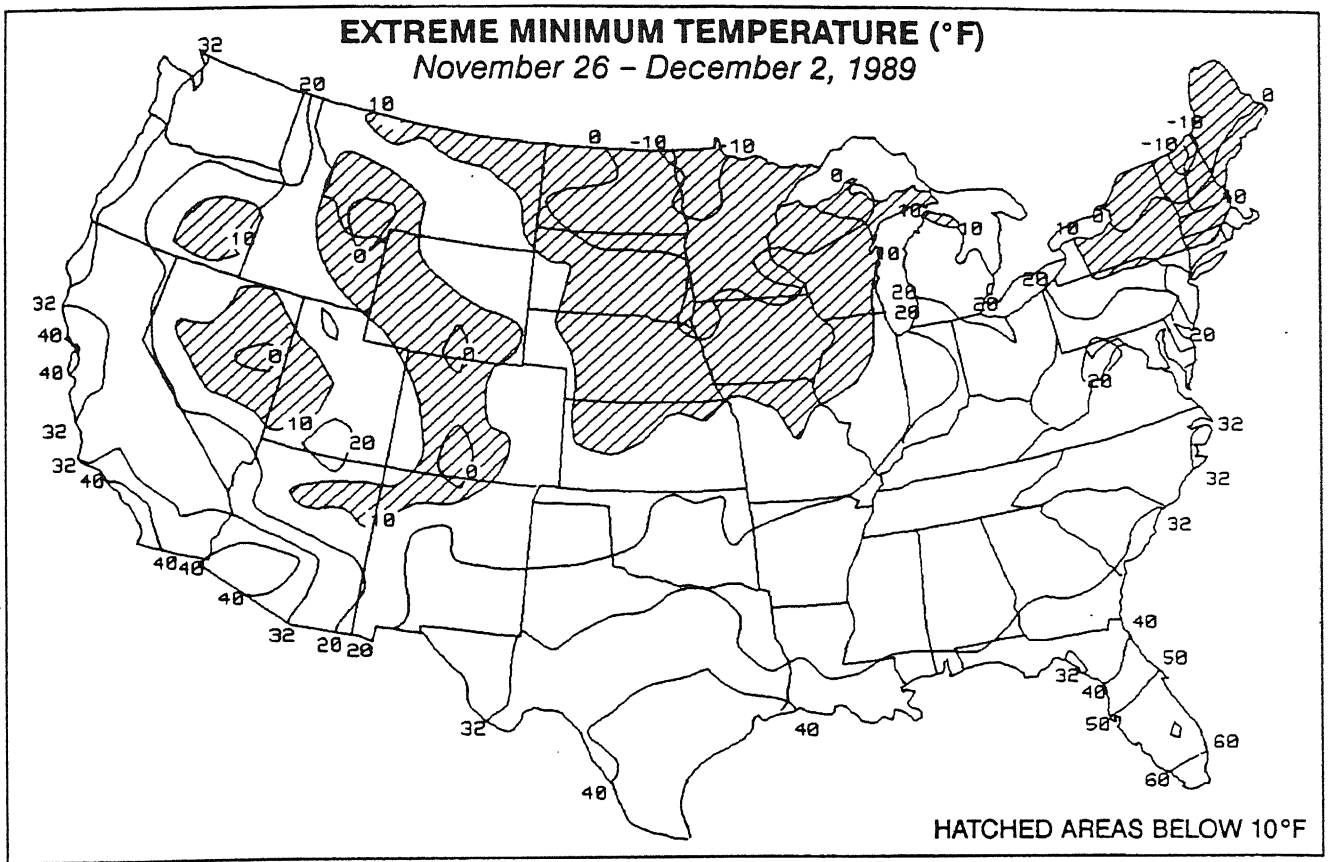
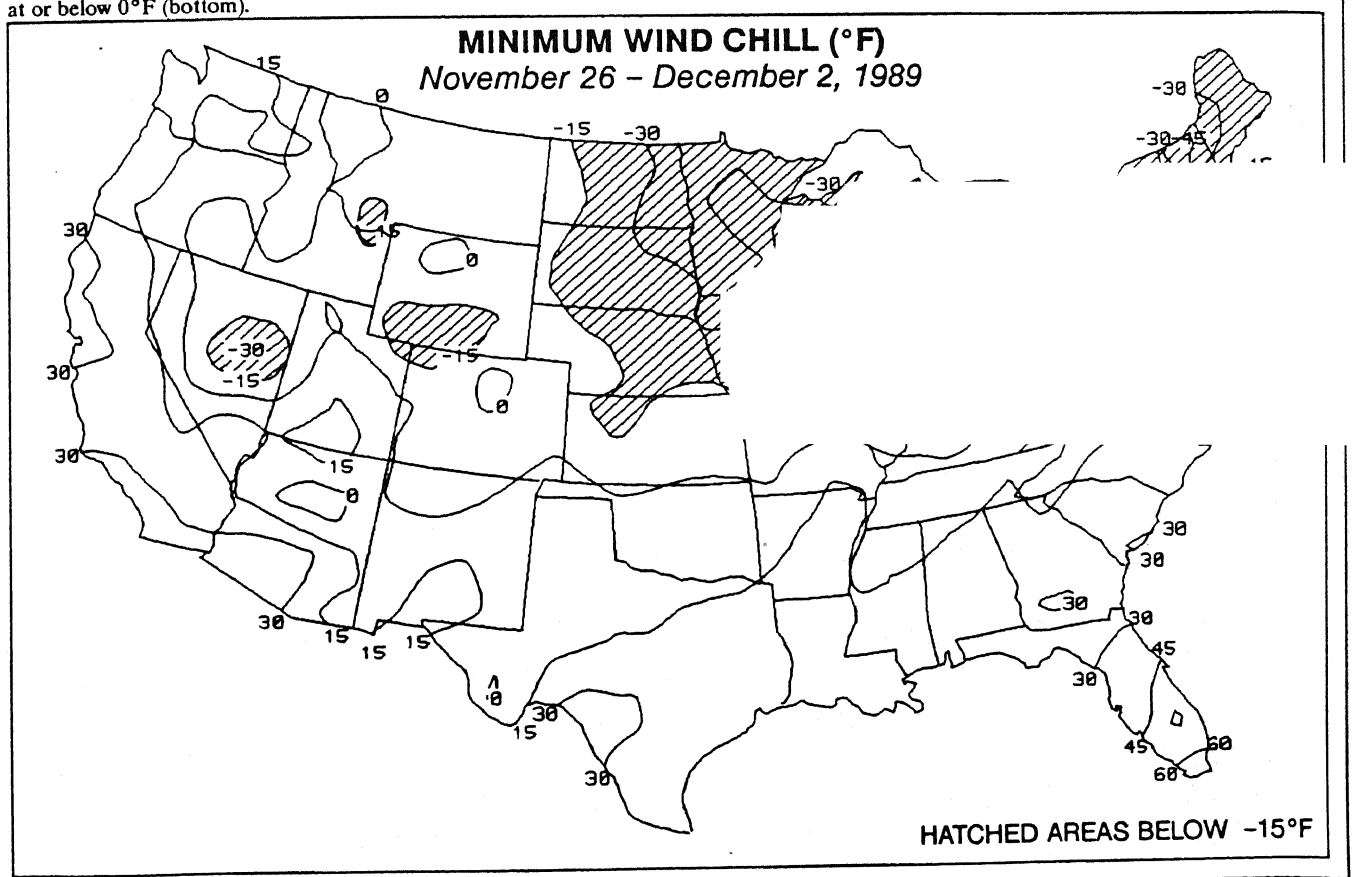
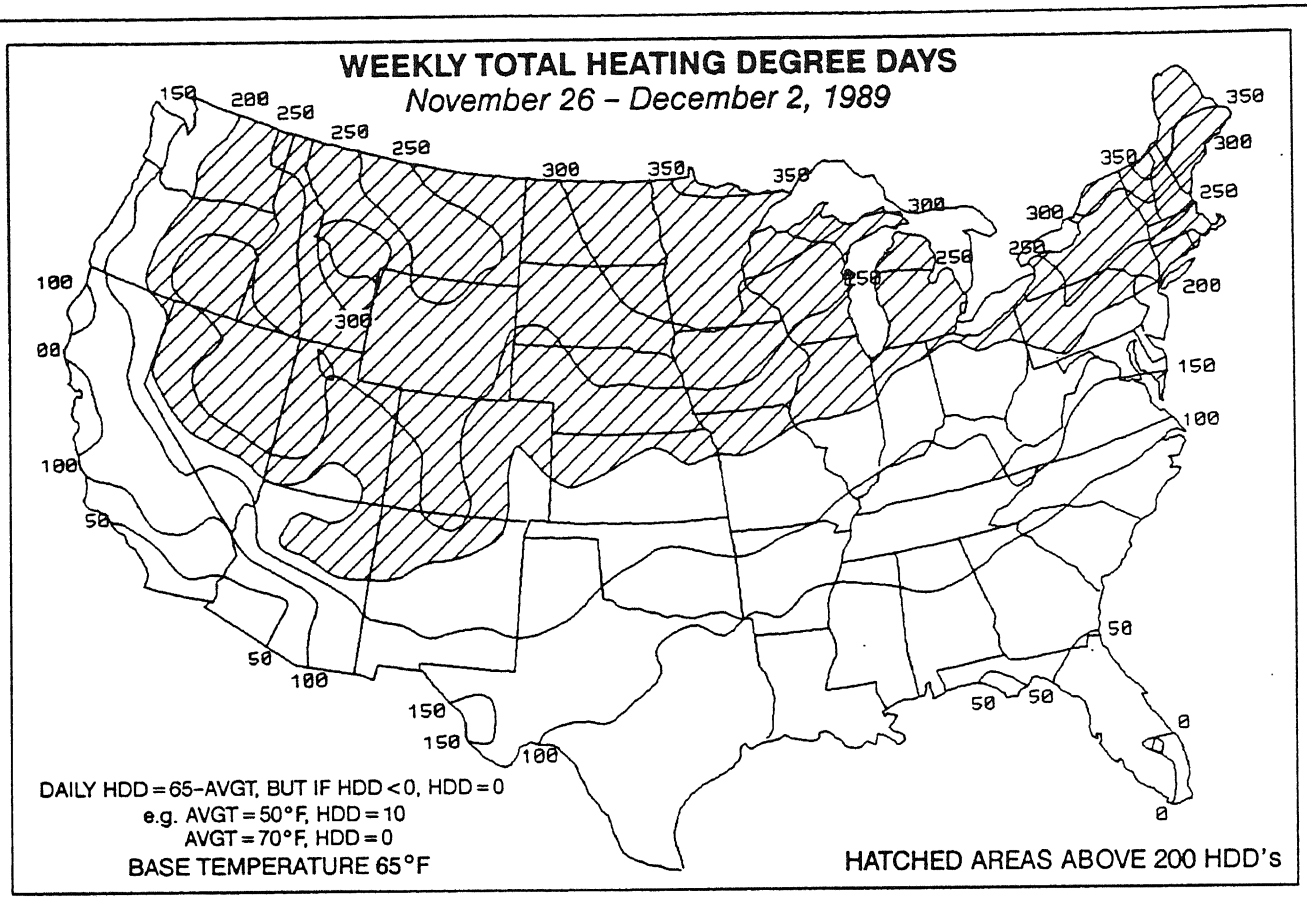


Figure 1. Extreme maximum temperatures (°F) during Nov. 26-Dec. 2, 1989. Hatched areas are more than 80°F, and isotherms are only drawn for 60°F, 70°F, 80°F, 85°F, and 90°F. Unseasonably cold air settled into the western half of the nation and kept highs from exceeding 80°F except in extreme southwestern California. Two brief warm spells in the South pushed readings above 80°F (more than 90°F in southern Texas), but colder weather during the latter half of the week put an end to the high temperatures.

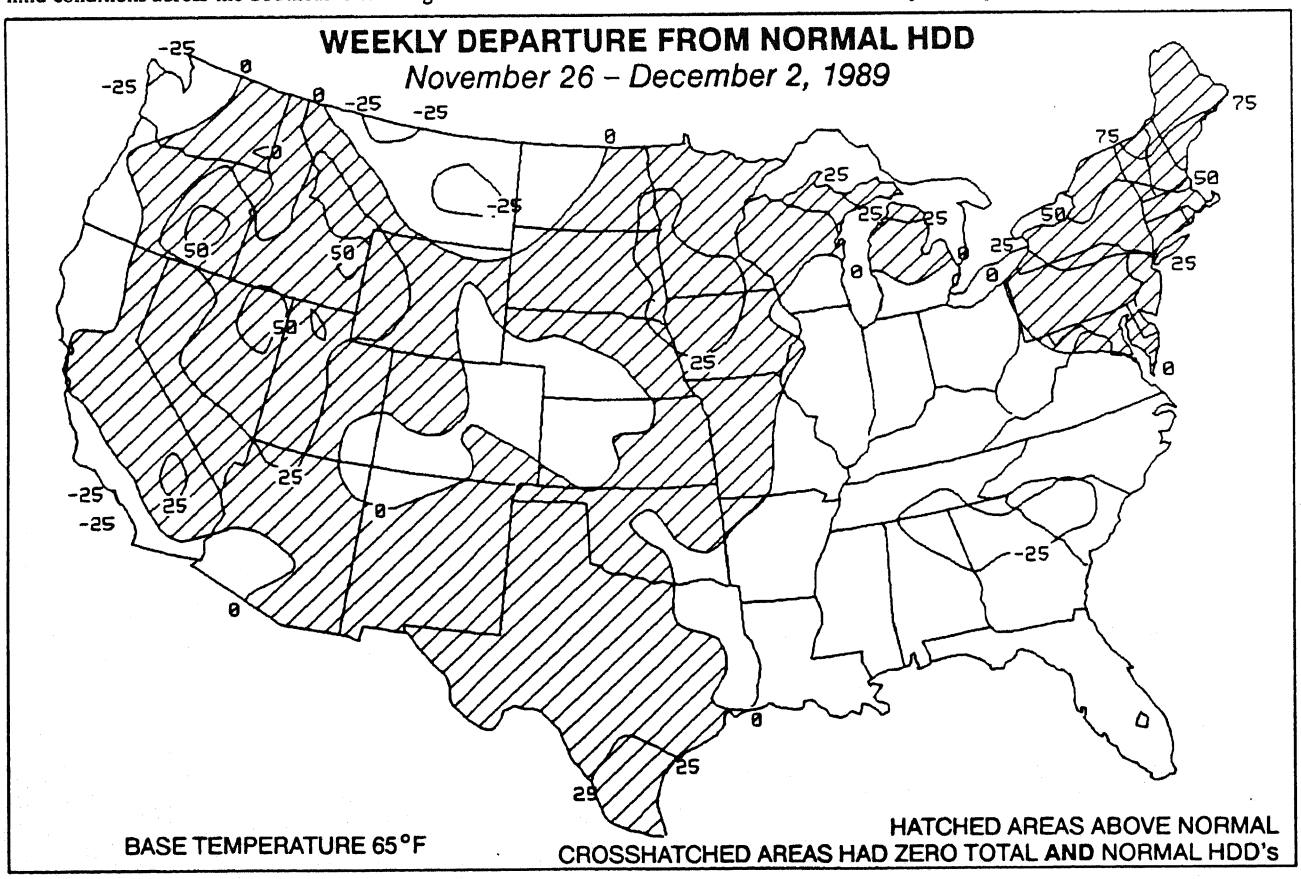


Frigid Arctic air blasted the north-central and northeastern U. S. last week as lows plummeted under -10°F in northern Minnesota and New Hampshire and readings in the teens were common from the Intermountain West eastward into New England and sections of the mid-Atlantic (top). Low temperatures and unusually gusty winds combined to produce extremely dangerous wind chills (less than -15°F) in parts of the West, the northern Great Plains and upper Midwest, and northern New England while most of the northern half of the country experienced wind chills at or below 0°F (bottom).



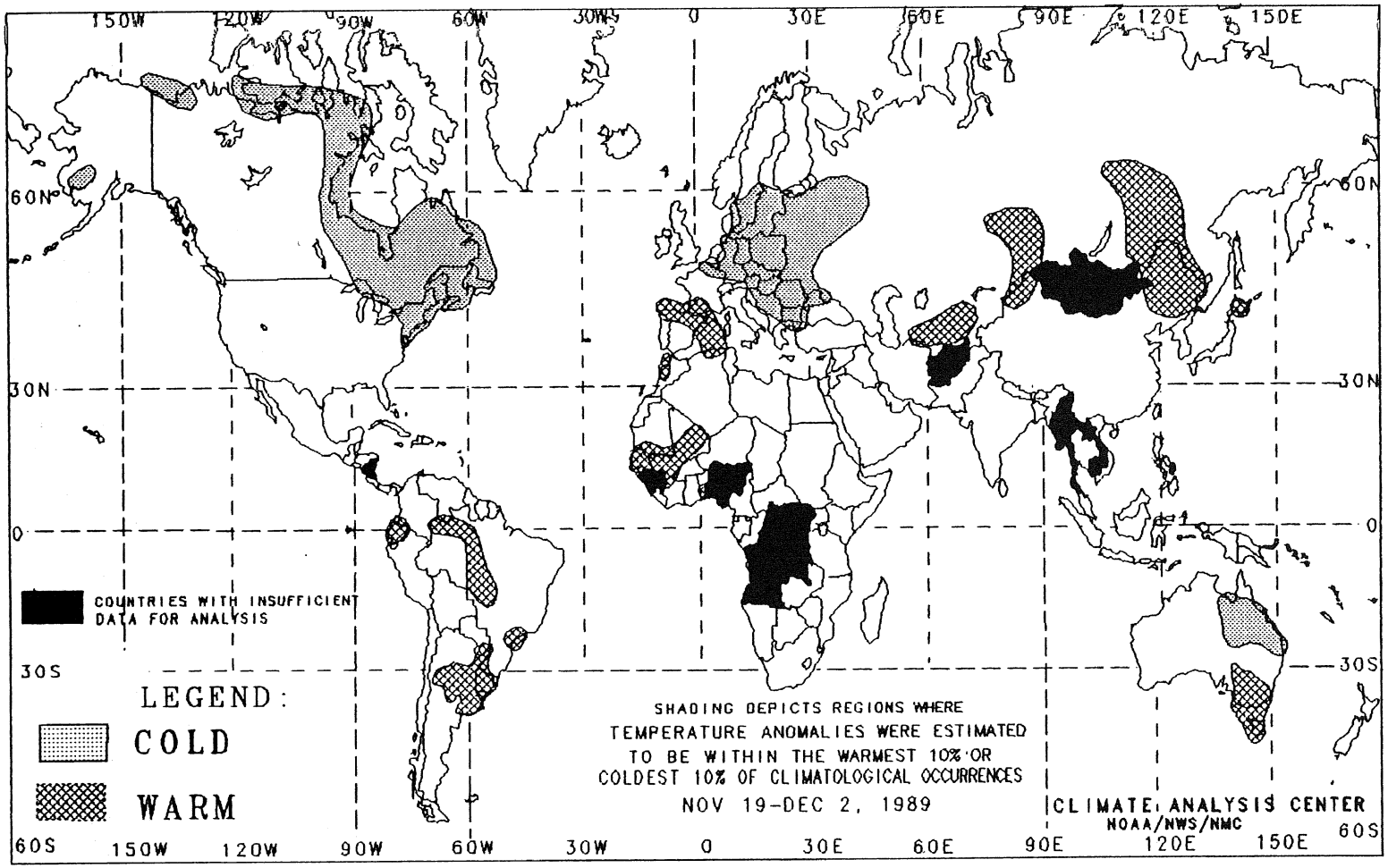


Colder than normal weather across much of the western half and northeastern quarter of the nation pushed weekly heating usage above 200 HDD's across the northern tier of states (top). With weekly temperatures averaging more than 6°F below normal, the greatest positive HDD departures (more than +50 HDD's) were found in parts of the Great Basin and north-central Rockies and throughout the Northeast while unseasonably mild conditions across the Southeast and along the Pacific Northwest Coast reduced the usual weekly heating demand (bottom).



GLOBAL TEMPERATURE ANOMALIES

2 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

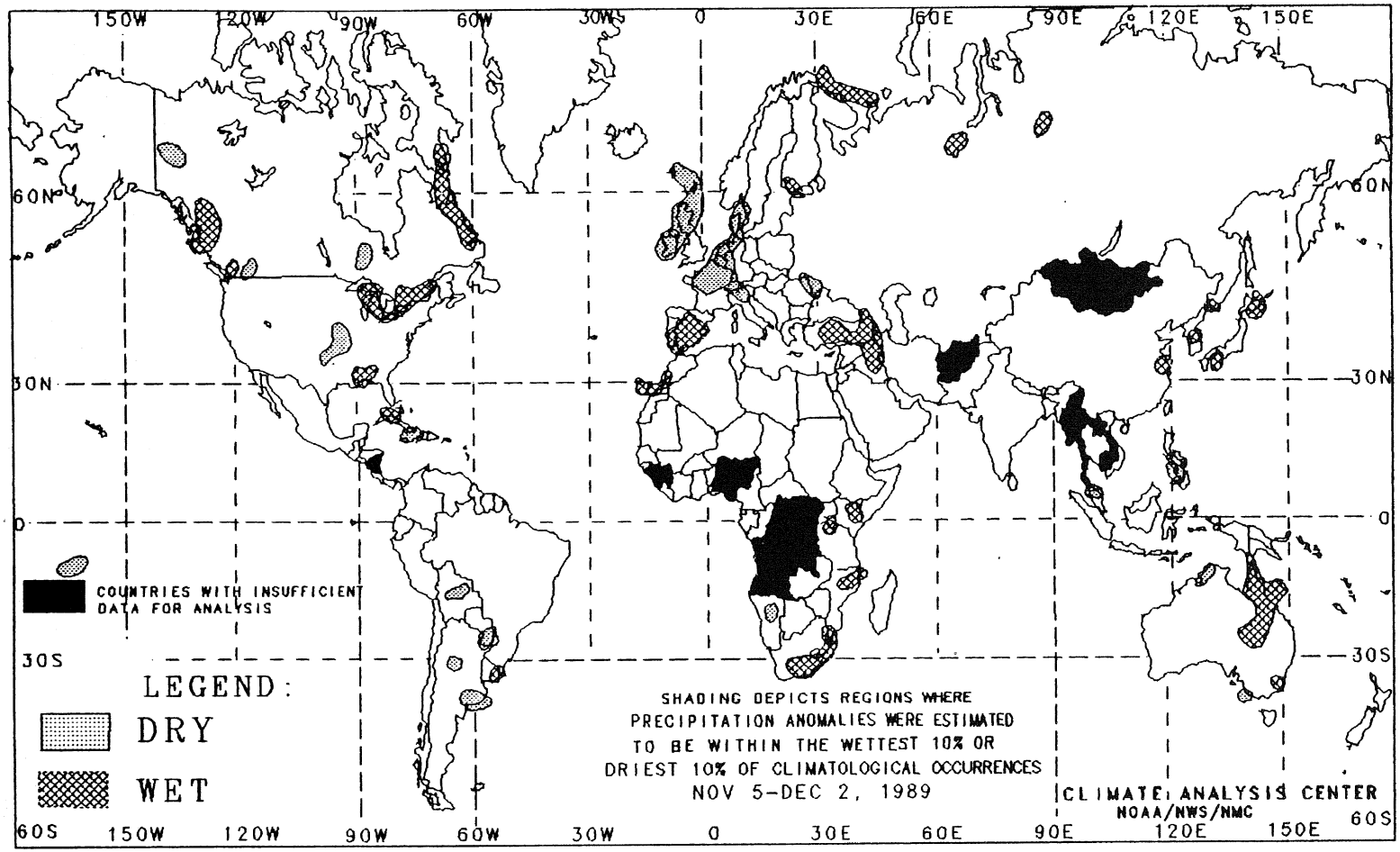
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

GLOBAL PRECIPITATION ANOMALIES

4 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

UNITED STATES MONTHLY CLIMATE SUMMARY

NOVEMBER 1989

November 1989 was characterized by unseasonably mild conditions in the West and South, several outbreaks of bitterly cold Arctic air across Alaska and the northeastern quarter of the country, a pre-Thanksgiving snow storm in the mid-Atlantic and New England, inundating rains along the central Gulf Coast, and exceptionally dry weather in Hawaii and the nation's midsection. Many stations in the southern Rockies, central Great Plains, and lower Missouri Valley experienced record November dryness as little or no precipitation fell during the month (see Figures 1 and 2, Table 5). The month commenced with cold conditions gradually being replaced from west to east by unseasonably mild weather. Small waves of low pressure that formed along a stationary front in the Southeast produced numerous heavy showers and thunderstorms throughout the central Gulf Coast states as New Orleans, LA received more than 13 inches in 24 hours. The warmth persisted across much of the country until mid-November when a strong cold front produced severe weather in the South and East and brought extremely cold air to the eastern half of the U.S. The hardest hit locations included Huntsville, AL where twisters took the lives of several people and caused extensive property damage, and Newburgh, NY when a tornado collapsed a school cafeteria wall onto many students. Farther north, frigid Arctic air covered much of Alaska where readings plummeted to -55°F at Northway on Nov. 12. By mid-month, unseasonably mild air continued in the western half of the nation while cold air and gusty winds blasted the upper Midwest, Great Lakes, mid-Atlantic, and New England. Heavy lake-effect snows buried portions of the Great Lakes snowbelt region. A storm system developed in the Southeast and quickly moved northeast, dumping light to moderate snow from Washington, D.C. to Boston, MA as many cities recorded the snowiest Thanksgiving on record. With the exception of abnormally cold air over the Great Basin, upper Midwest, and the Northeast and welcome rains in extreme southern Texas, very little precipitation and near normal temperatures occurred during the last week of November. On Nov. 30, the last official day of the 1989 Atlantic-Caribbean hurricane season, Tropical Storm Karen formed in the northwestern Caribbean Sea and soaked western Cuba and the Isle of Youth with up to 15 inches of rain.

Based upon the River Forecast Centers stations, the largest November precipitation amounts (between 4 and 8 inches) were observed along the central Gulf Coast northeastward into the southern Appalachians, in sections of the northern Appalachians, across extreme southern Florida, along the southeastern Alaskan and Pacific Northwest Coasts, and in the northern Cascades and Sierra Nevadas. Locally heavy totals (between 8 and 28 inches) were reported in southeastern Louisiana, southern Mississippi, and southern Georgia. Surplus November precipitation was limited to the Southeast and the southern Appalachians, around the Great Lakes region, in northern New England, and across parts of the northern tier of states from Washington eastward to Wisconsin (see Figures 1 and 2, Table 1).

After experiencing unusually wet Novembers during the past several years in the lower 48 states (see page 11), much of the nation observed subnormal monthly precipitation (see Figures 1 and 2, Table 2). On a national basis, November 1989 ranked as the ninth driest November (based upon the standardized precipitation index) since 1895, according to the National Climatic Data Center. Regionally, the Southwest and West recorded the second and thirteenth driest November, respectively. Even though many locations in the Texas and Oklahoma panhandles and most of Kansas received no measurable November precipitation (see Figure 2), the inclusion of rain-soaked Louisiana and Mississippi in the South region increased its precipitation ranking to the 28th driest. On a state basis, however, Kansas experienced the driest November ever (see Figure 7) while Nebraska observed its third driest November on record (not shown). With meager October precipitation in the same area, the hard red winter wheat belt (roughly from southern Nebraska southward into the Texas panhandle) endured the sixth driest October-November during the past 95 years (see Figure 8). Little or no precipitation also occurred in northern Alaska and the eastern islands of Hawaii. Hilo, HI, which normally receives nearly 15 inches of rain, measured a November record minimum of 1.02 inches.

November 1989 temperatures across the contiguous United States averaged slightly above the long-term mean (34th warmest on record). Almost all of the western and southern halves of the nation observed positive monthly departures, but most of these areas were within 3°F of normal. The greatest departures (more than +4°F) were reported in the northern and central Rockies due in part to warm Chinook winds and across sections of the Southwest and Deep South where intrusions of cold air were short-lived (see Figures 3 and 4, Table 3).

In sharp contrast, frequent invasions of bitterly cold Arctic air, especially during the latter half of the month, kept November temperatures below normal in the upper Midwest, Great Lakes, and the Northeast. Monthly temperatures averaged more than 4°F below normal in Minnesota, Michigan, and the northern parts of Iowa, Wisconsin, and Maine (see Figures 3 and 4, Table 4). In Alaska, a strong dome of high pressure brought exceedingly low temperatures to much of the state during the first half of November and to the northern portions of the state during the remainder of the month as November departures approached -12°F at Barrow.

TEMPERATURE AND PRECIPITATION RANKINGS FOR NOVEMBER 1989, BASED ON THE PERIOD 1895 - 1989 (95 YEARS) WHERE 1 = DRIEST/COLDEST AND 95 = WETTEST/HOTTEST

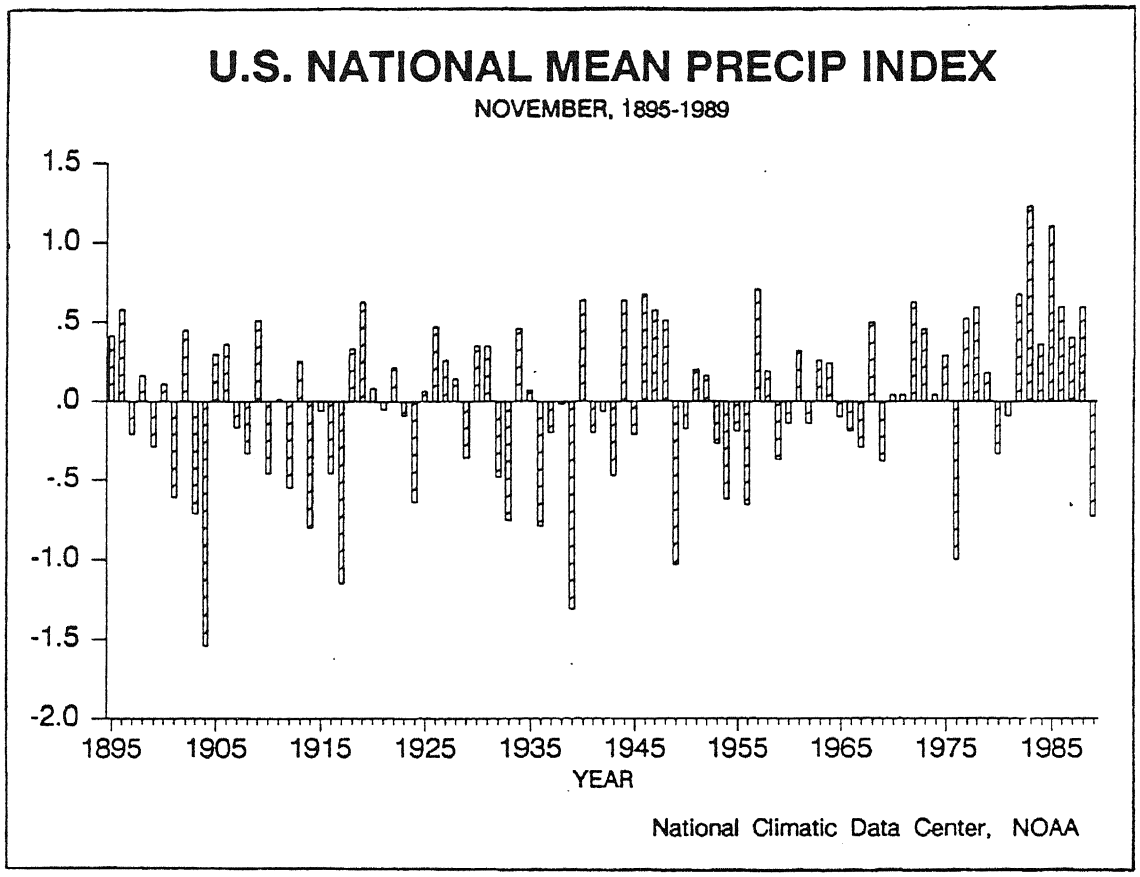
REGION	*PRECIPITATION*	*TEMPERATURE*
NORTHEAST	36	23
EAST NORTH CENTRAL	33	12
CENTRAL	25	49
SOUTHEAST	69	55
WEST NORTH CENTRAL	35	69
SOUTH	28	69
SOUTHWEST	2	78
NORTHWEST	31	70
WEST	13	60
NATIONAL	19	62

National Climatic Data Center

PRECIPITATION RANKINGS FOR JANUARY - NOVEMBER 1989, BASED ON THE PERIOD 1895 - 1989 (95 YEARS) WHERE 1 = DRIEST AND 95 = WETTEST

STATE	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*
AL	87	IA	8	NE	7	RI	88
AZ	6	KS	48	NV	30	SC	80
AR	73	KY	93	NH	56	SD	35
CA	19	LA	83	NJ	93	TN	93
CO	8	ME	36	NM	16	TX	42
CT	92	MD	90	NY	89	UT	7
DE	95	MA	82	NC	93	VT	75
FL	19	MI	19	ND	13	VA	92
GA	67	MN	26	OH	89	WA	39
ID	37	MS	88	OK	74	WV	95
IL	24	MO	14	OR	30	WI	10
IN	84	MT	71	PA	88	WY	24

National Climatic Data Center



U.S. National November 1989 mean precipitation index (top) and temperature (bottom). The November precipitation for each climate division in the country (total of 344) was first standardized over the 1951-1980 period, then weighed by area and averaged to determine a national standardized precipitation value. Negative (positive) values are dry (wet). Based upon the index, November 1989 ranked as the ninth driest November during the past 95 years. November 1989 temperatures across the contiguous U.S. averaged slightly above the long-term mean, ranking as the 34th warmest November on record (since 1895). The 1989 value is based upon preliminary data which has a standard error of estimate of 0.26°F, indicated in the figure as '+'.

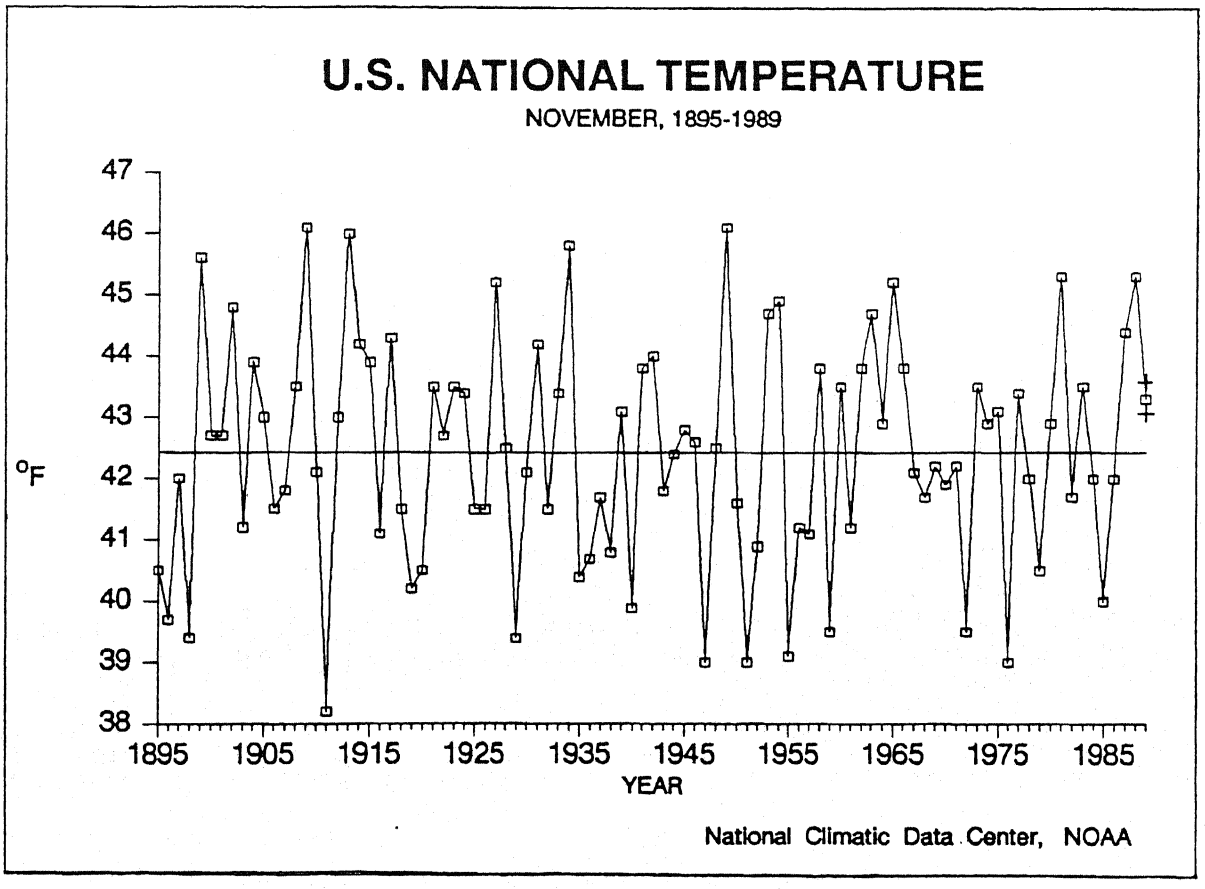


TABLE 1. NOVEMBER STATIONS WITH MORE THAN 150% OF NORMAL PRECIPITATION AND MORE THAN 4 INCHES OF PRECIPITATION; OR, STATIONS WITH MORE THAN 6 INCHES OF PRECIPITATION AND NO NORMALS.

STATION	TOTAL (INCHES)	PCT. OF NORMAL	STATION	TOTAL (INCHES)	PCT. OF NORMAL
NEW ORLEANS NAS, LA	22.15	***	HUNTSVILLE, AL	6.79	160.1
NEW ORLEANS/MOISANT, LA	19.81	490.4	TACOMA/FT. LEWIS-GRAY AAF, WA	6.67	***
BATON ROUGE, LA	13.55	343.0	TACOMA/MCCHORD AFB, WA	6.57	***
MOBILE, AL	11.33	309.6	KEY WEST, FL	6.54	200.0
DOTHAN, AL	11.25	***	MONTGOMERY, AL	6.36	214.9
NEW ORLEANS/LAKE FRONT, LA	10.81	***	COLUMBUS/FT. BENNING AAF, GA	6.33	***
BILOXI/KEESLER AFB, MS	10.44	322.2	ANNISTON, AL	6.08	181.5
PENSACOLA NAS, FL	8.32	***	VALPARAISO/EGLIN AFB, FL	6.00	188.7
BELLINGHAM, WA	8.30	178.9	MERIDIAN, MS	5.97	171.6
LAFAYETTE, LA	7.70	213.9	HAMPTON/LANGLEY AFB, VA	5.84	200.7
PENSACOLA, FL	7.61	150.7	COLUMBUS, GA	4.94	161.4
MILTON/WHITING NAS, FL	7.20	***	GRAND RAPIDS, MI	4.86	170.5
JACKSON, MS	6.86	175.0	MANSFIELD, OH	4.02	151.1

(Note: Stations without precipitation normals are indicated by asterisks.)

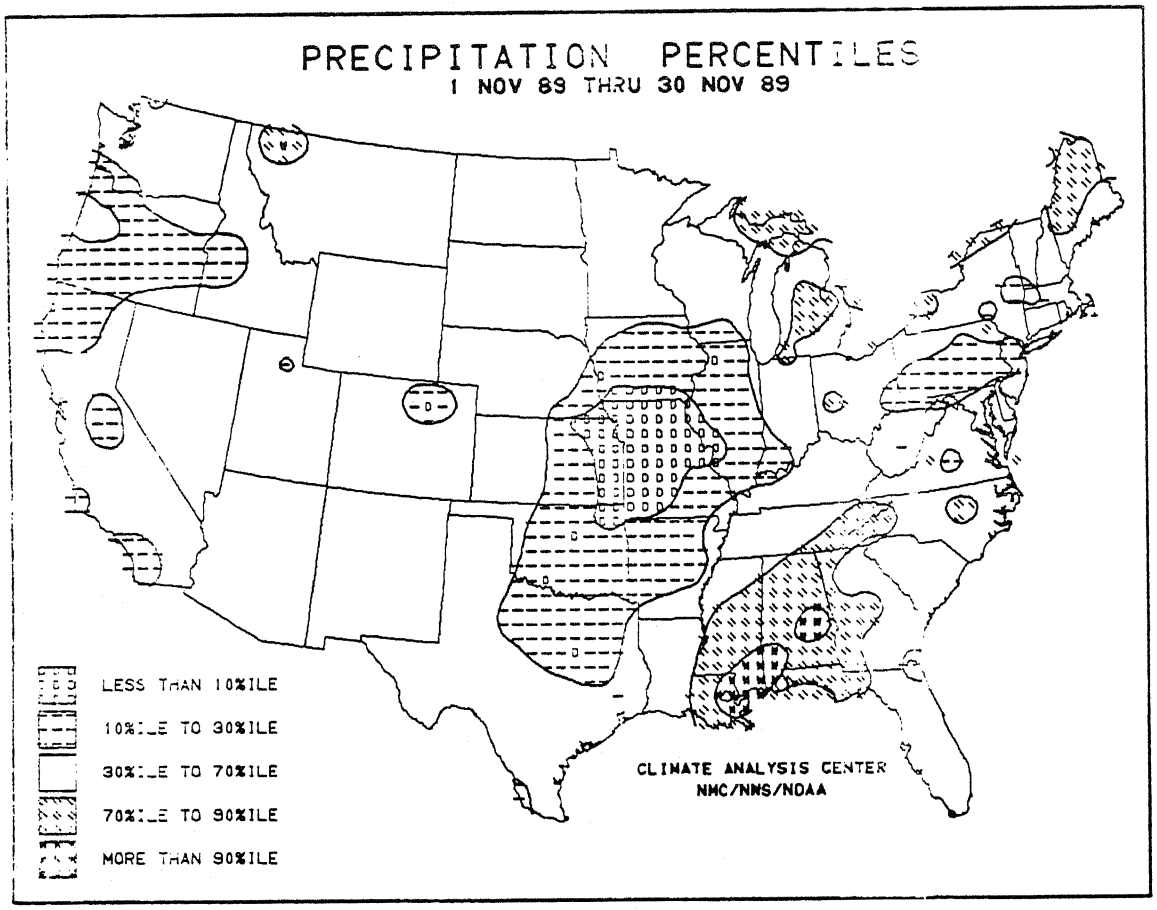


Figure 1. Precipitation percentiles for November 1989. Statistically significant dryness (<30%ile) afflicted the south-central Great Plains and lower Missouri Valley as portions of these regions experienced record minimum precipitation. Just to the west of this area, from northern Texas northward into Nebraska, even though little or no monthly precipitation was recorded, significant dry percentiles (<30%ile) were not drawn since this region is normally arid (amount< 1") during November. Subnormal precipitation also fell along much of the West Coast as their rainy season got off to a slow start. In contrast, substantial wetness inundated parts of the central Gulf Coast, particularly around New Orleans, LA, and across the central and eastern Great Lakes and northern New England.

TABLE 2. NOVEMBER STATIONS WITH LESS THAN 50% OF NORMAL PRECIPITATION AND NORMAL PRECIPITATION 3.00 INCHES OR MORE.

STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)	STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)
HARRISON, AR	0.34	11.3	3.00	REDDING, CA	1.20	21.6	5.56
UKIAH, CA	0.44	8.6	5.10	DOVER AFB, DE	1.25	37.6	3.32
WEST PLAINS, MO	0.45	11.9	3.79	NEW BERN, NC	1.31	42.5	3.08
MCALESTER, OK	0.46	15.0	3.07	CAPE GIRARDEAU, MO	1.32	35.8	3.69
HONOLULU, OAHU, HI	0.50	15.6	3.20	TEXARKANA, AR	1.33	34.5	3.85
LONGVIEW, TX	0.58	14.9	3.88	POUGHKEEPSIE, NY	1.39	38.9	3.57
FORT SMITH, AR	0.60	17.2	3.48	MILLVILLE, NJ	1.52	42.3	3.59
FAYETTEVILLE, AR	0.60	17.6	3.40	WILMINGTON, DE	1.57	47.1	3.33
RED BLUFF, CA	0.84	27.3	3.08	EUREKA, CA	1.60	27.2	5.88
POPLAR BLUFF, MO	0.85	22.9	3.71	WRIGHTSTOWN/MCGUIRE,NJ	1.60	45.6	3.51
WHITE PLAINS, NY	0.89	19.2	4.63	COLLEGE STATION, TX	1.63	48.9	3.33
HILO/LYMAN, HAWAII, HI	1.02	6.9	14.86	EVANSVILLE, IN	1.64	48.8	3.36
LUFKIN, TX	1.13	31.5	3.59	EL DORADO, AR	1.72	44.8	3.84
JONESBORO, AR	1.15	30.7	3.75	ALEXANDRIA/ENGLAND, LA	1.76	42.8	4.11
WEST PALM BEACH, FL	1.15	34.1	3.37	LITTLE ROCK, AR	1.90	43.7	4.35
GREENWOOD, MS	1.16	25.5	4.55	MEACHAM, OR	1.95	47.3	4.12

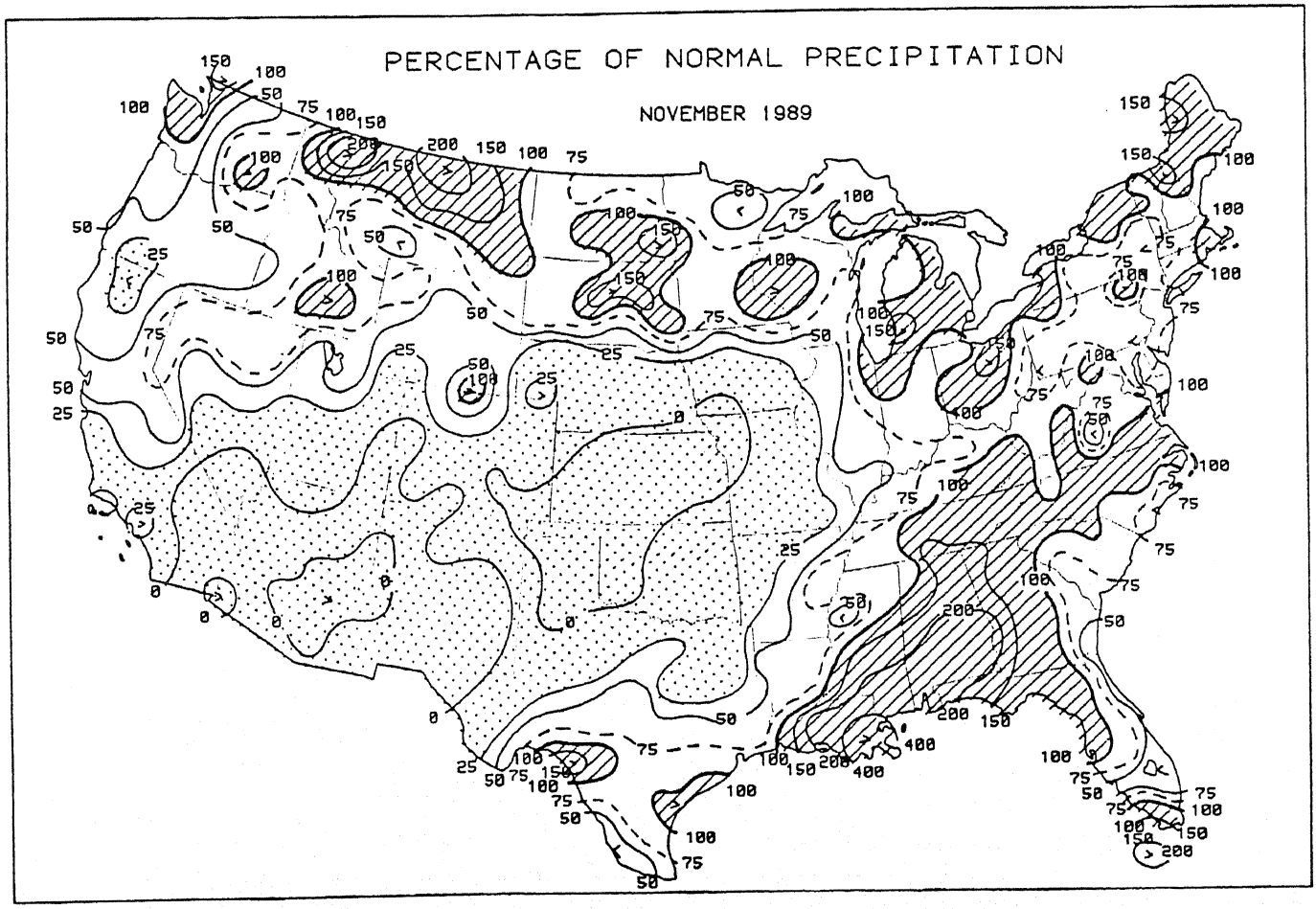


Figure 2. Percent of normal precipitation during November 1989. Dotted areas are less than 25%, and hatched areas are above normal. Most locations in the contiguous U.S. measured below normal November precipitation, especially in the central Plains, as much of the Texas and Oklahoma panhandles, Kansas, northwestern Missouri, and southeastern Nebraska observed no measurable precipitation. The regions with surplus monthly precipitation were limited to parts of the Southeast and along the extreme northern sections of the country.

TABLE 3. NOVEMBER AVERAGE TEMPERATURES 4.0°F OR MORE ABOVE NORMAL.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
VICTORVILLE/GEORGE AFB, CA	+7.0	56.3	KALISPELL, MT	+4.5	35.8
LEWISTON, ID	+7.0	47.1	AUSTIN/BERGSTROM AFB, TX	+4.3	62.9
PHOENIX, AZ	+5.8	66.4	TRUTH OR CONSEQUENCES, NM	+4.3	52.8
BLUE CANYON, CA	+5.4	49.6	ROSWELL, NM	+4.3	51.5
BOZEMAN, MT	+5.3	35.5	CASPER, WY	+4.3	37.2
AKRON, CO	+5.2	41.4	LANDER, WY	+4.3	35.2
MISSOULA, MT	+5.2	37.2	DALLAS/LOVE FIELD, TX	+4.2	59.9
MILES CITY, MT	+5.2	37.2	MONROE, LA	+4.2	58.9
HELENA, MT	+5.2	36.9	JUNCTION, TX	+4.2	57.8
BUTTE, MT	+5.1	32.6	BEEVILLE NAS, TX	+4.1	67.0
GLENDALE/LUKE AFB, AZ	+4.8	63.4	AUSTIN, TX	+4.1	62.8
ROCK SPRINGS/SWEETWATER, WY	+4.8	34.8	DENVER, CO	+4.1	42.8
BILLINGS, MT	+4.7	39.7	COLORADO SPRINGS, CO	+4.1	41.5
MCALLEN, TX	+4.6	71.1	SHERIDAN, WY	+4.1	36.7
OMAK, WA	+4.6	39.2	CHARLESTON, SC	+4.0	60.6
WORLAND, WY	+4.6	35.4	GOODLAND, KS	+4.0	42.1

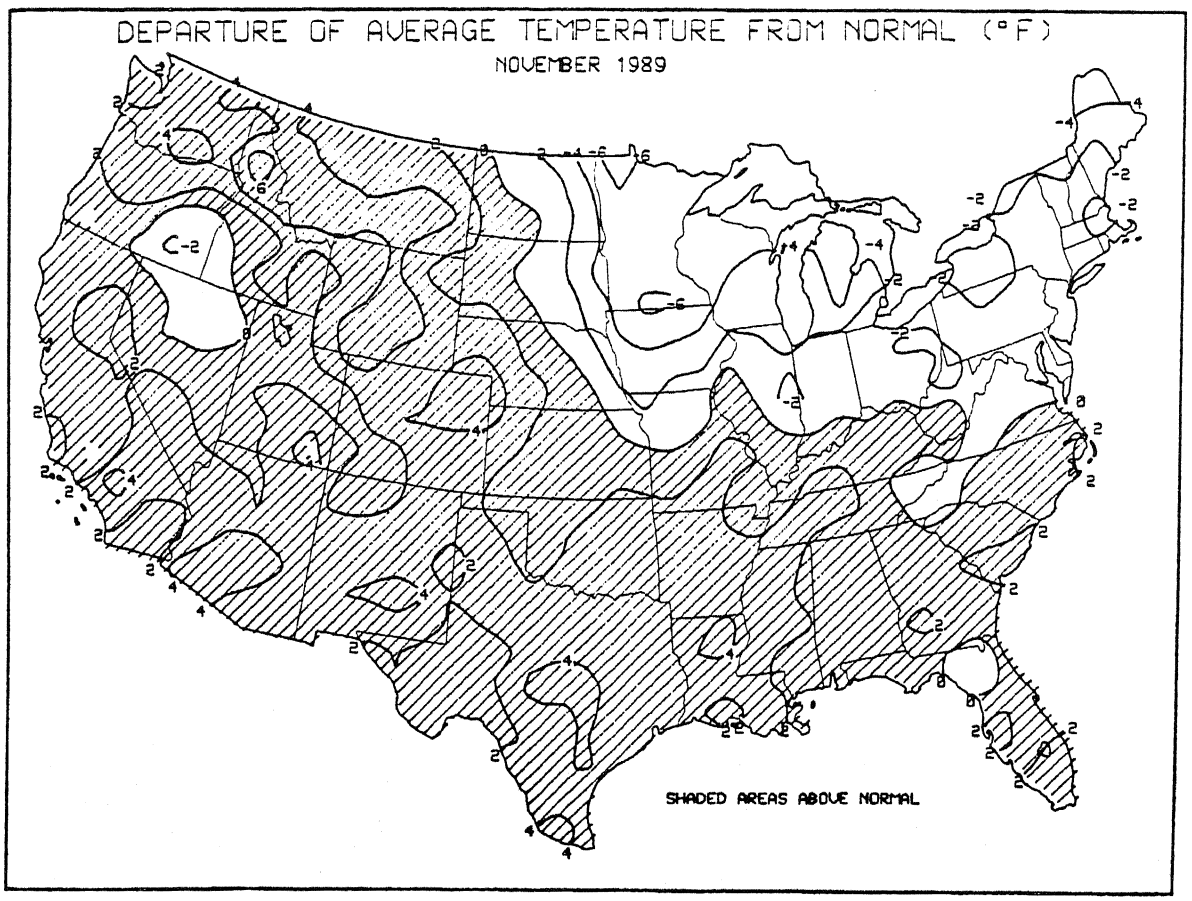


Figure 3. Average temperature departure from normal (°F) during November 1989. With the exception of the northeastern quarter of the nation, almost all of the lower 48 states reported a milder than normal November. The greatest positive departures (more than +4°F) occurred in the northern Rockies and across portions of the Southwest and the southern Great Plains. A persistent upper-air trough of low pressure located over the Great Lakes brought several episodes of bitterly cold Arctic air to the eastern third of the nation, and temperatures averaged more than 4°F below normal in the upper Mississippi Valley and Great Lakes and northern Maine.

TABLE 4. NOVEMBER AVERAGE TEMPERATURES 4.5°F OR MORE BELOW NORMAL.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
BARTER ISLAND, AK	-13.1	-12.6	SPENCER, IA	-5.5	28.0
BARROW, AK	-11.7	-12.5	DULUTH, MN	-5.4	23.2
FAIRBANKS, AK	-11.2	-7.1	ST. CLOUD, MN	-5.4	25.0
BIG DELTA, AK	-11.1	-3.0	MARQUETTE, MI	-5.2	24.8
BETTLES, AK	-10.8	-9.8	ANCHORAGE, AK	-5.0	17.2
FORT YUKON, AK	-9.1	-13.4	MINNEAPOLIS, MN	-5.0	28.0
BETHEL, AK	-8.7	9.0	ESCENABA, MI	-5.0	29.9
UNALAKLEET, AK	-8.2	5.3	LANSING, MI	-5.0	33.6
ANIAK, AK	-8.1	6.6	HANCOCK/HOUGHTON CO., MI	-4.8	26.3
GULKANA, AK	-8.1	-0.4	HOULTON, ME	-4.8	27.6
KOTZEBUE, AK	-7.6	0.8	KING SALMON, AK	-4.7	18.5
WARROAD, MN	-6.9	18.6	SAULT STE. MARIE, MI	-4.7	28.0
NORTHWAY, AK	-6.6	-8.6	ALEXANDRIA, MN	-4.6	24.5
NOME, AK	-6.4	10.0	WATERTOWN, SD	-4.6	25.3
ROCHESTER, MN	-5.9	27.1	PELLSTON, MI	-4.6	29.9
PARK FALLS, WI	-5.8	24.2	SAGINAW, MI	-4.6	33.8
MASON CITY, IA	-5.8	28.2			

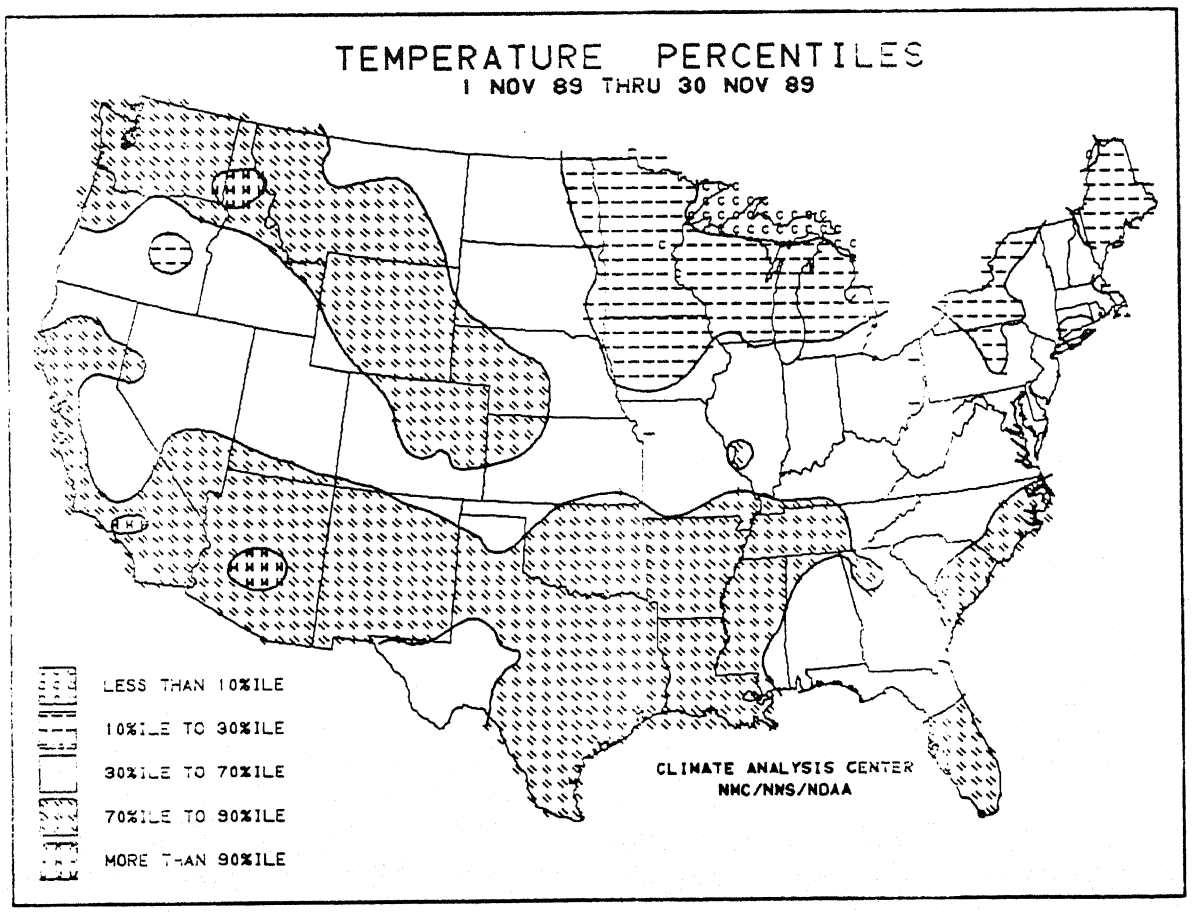


Figure 4. Temperature percentiles for November 1989. While significant coldness (<30%ile) was entrenched across the northeastern quarter of the U.S., unseasonably mild air (>70%ile) covered much of the West and throughout the southern half of the country. Farther north, frigid conditions prevailed across much of Alaska (not shown) as almost every reporting stations recorded subnormal November temperatures.

TABLE 5. RECORD NOVEMBER PRECIPITATION.

STATION	TOTAL (INCHES)	NORMAL (INCHES)	PCT. OF NORMAL	RECORD TYPE	RECORDS BEGAN
NEW ORLEANS/MOISANT, LA	19.81	4.04	490.4	HIGHEST	1851
BATON ROUGE, LA	13.55	3.95	343.0	HIGHEST	1945
HILO/LYMAN, HAWAII, HI	1.02	14.86	6.9	LOWEST	1905
COLUMBIA, MO	0.42	2.22	18.9	LOWEST	1961
SPRINGFIELD, MO	0.19	2.89	6.6	LOWEST	1946
OMAHA, NE	0.03	1.32	2.3	LOWEST	1873
LINCOLN, NE	0.01	0.96	1.0	LOWEST	1971
TOPEKA, KS	0.00	1.75	0.0	LOWEST	1887
KANSAS CITY, MO	0.00	1.64	0.0	LOWEST	1888
WICHITA, KS	0.00	1.45	0.0	LOWEST	1947
CONCORDIA, KS	0.00	1.05	0.0	LOWEST	1886
BLANDING, UT	0.00	0.89	0.0	LOWEST	1906
GRAND ISLAND, NE	0.00	0.78	0.0	LOWEST	1939
GULKANA, AK	0.00	0.74	0.0	LOWEST	1951
DODGE CITY, KS	0.00	0.74	0.0	LOWEST	1874
GRAND JUNCTION, CO	0.00	0.61	0.0	LOWEST	1946
LUBBOCK, TX	0.00	0.57	0.0	LOWEST	1947
AMARILLO, TX	0.00	0.56	0.0	LOWEST	1892
FORT YUKON, AK	0.00	0.44	0.0	LOWEST	1918
LAS VEGAS, NV	0.00	0.42	0.0	LOWEST	1937
BARTER ISLAND, AK	0.00	0.39	0.0	LOWEST	1948
BIG DELTA, AK	0.00	0.39	0.0	LOWEST	1951
ALBUQUERQUE, NM	0.00	0.36	0.0	LOWEST	1931
ROSWELL, NM	0.00	0.34	0.0	LOWEST	1951
EL PASO, TX	0.00	0.32	0.0	LOWEST	1879
BARROW, AK	0.00	0.28	0.0	LOWEST	1921

Note: Trace precipitation is considered no precipitation. Stations with no precipitation are only included if normal precipitation is 0.25 inches or more.

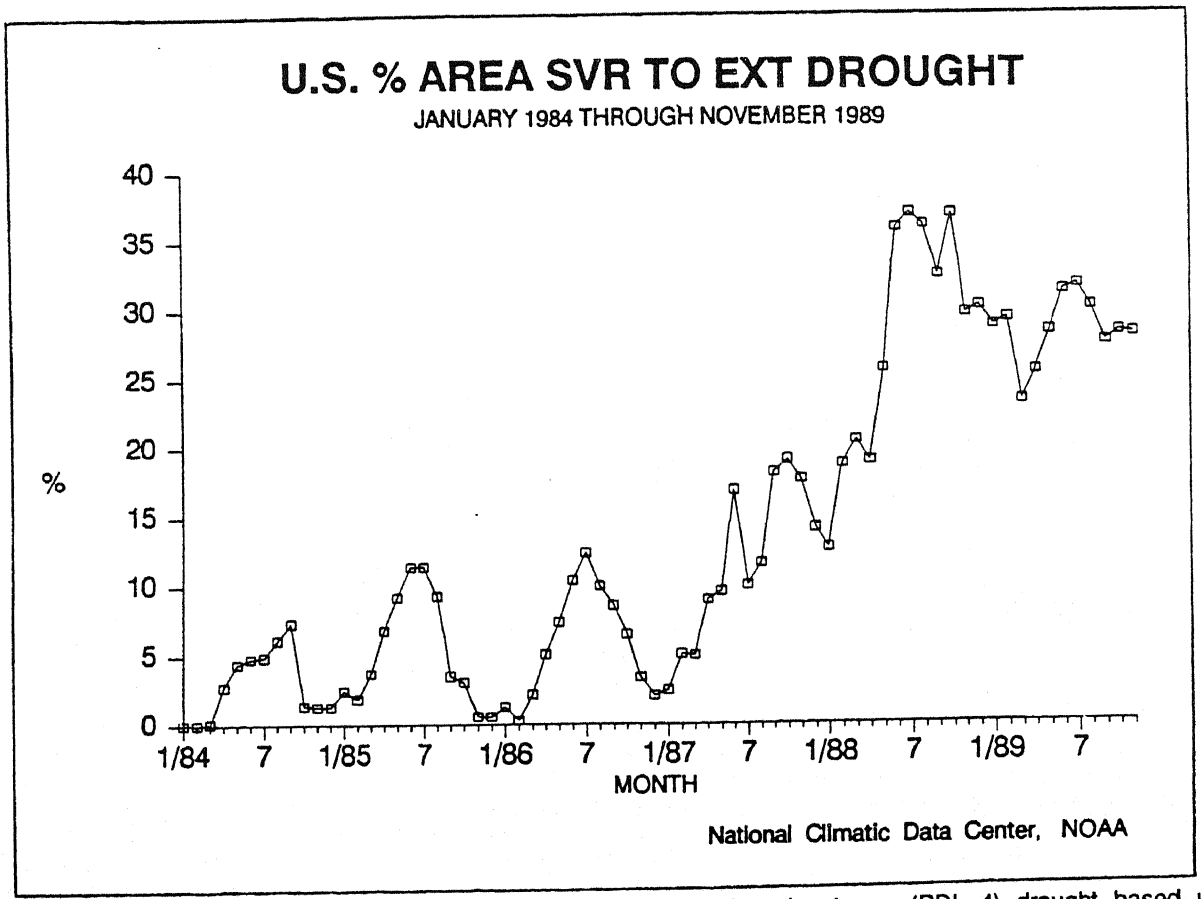


Figure 5. Percent area of the contiguous U.S. with severe (PDI<-3) and extreme (PDI<-4) drought based upon the Palmer Drought Index (PDI). Approximately a fourth of the country was experiencing severe to extreme long-term dryness by the end of November. Even though little or no November precipitation fell on much of the nation's midsection, heavy rains during the late spring and summer months kept subsoil moisture levels generally near normal in the central and southern Great Plains and lower Missouri Valley. Topsoil moisture, however, was short throughout much of the central Plains and western Corn Belt.

TABLE 6. RECORD NOVEMBER AVERAGE TEMPERATURES.

STATION	AVERAGE (°F)	NORMAL (°F)	DEPARTURE (°F)	RECORD TYPE	RECORDS BEGAN
LEWISTON, ID	47.1	40.1	+7.0	HIGHEST	1951
MARQUETTE, MI	24.8	30.0	-5.2	LOWEST	1873
BARROW, AK	-12.5	-0.8	-11.7	LOWEST	1921

TABLE 7. RECORD NOVEMBER EXTREME TEMPERATURES.

STATION	EXTREME (°F)	DATE	RECORD TYPE	RECORDS BEGAN
DALLAS/FT. WORTH, TX	89	14 NOV 89	HIGHEST	1953
HOUSTON, TX	89	8 NOV 89	HIGHEST	1970
MIAMI, FL	89	16 NOV 89	HIGHEST	1940
LAKE CHARLES, LA	87	8 NOV 89	HIGHEST	1962
ST. LOUIS, MO	85	11 NOV 89	HIGHEST	1958
SPRINGFIELD, MO	80	11 NOV 89	HIGHEST	1946
SCOTTSBLUFF, NE	80	12 NOV 89	HIGHEST	1943
DENVER, CO	79	19 NOV 89	HIGHEST	1935
YAKIMA, WA	73	10 NOV 89	HIGHEST	1947
BOSTON, MA	15	24 NOV 89	LOWEST	1936
ATLANTIC CITY, NJ	11	24 NOV 89	LOWEST	1943
WASHINGTON/DULLES, VA	9	24 NOV 89	LOWEST	1963
PROVIDENCE, RI	6	24 NOV 89	LOWEST	1954
PORTLAND, ME	3	24 NOV 89	LOWEST	1940
HARTFORD, CT	1	24 NOV 89	LOWEST	1954
HOUGHTON LAKE, MI	-2	23 NOV 89	LOWEST	1964
CARIBOU, ME	-5	30 NOV 89	LOWEST	1939
CONCORD, NH	-5	24 NOV 89	LOWEST	1942
MARQUETTE, MI	-6	29 NOV 89	LOWEST	1979

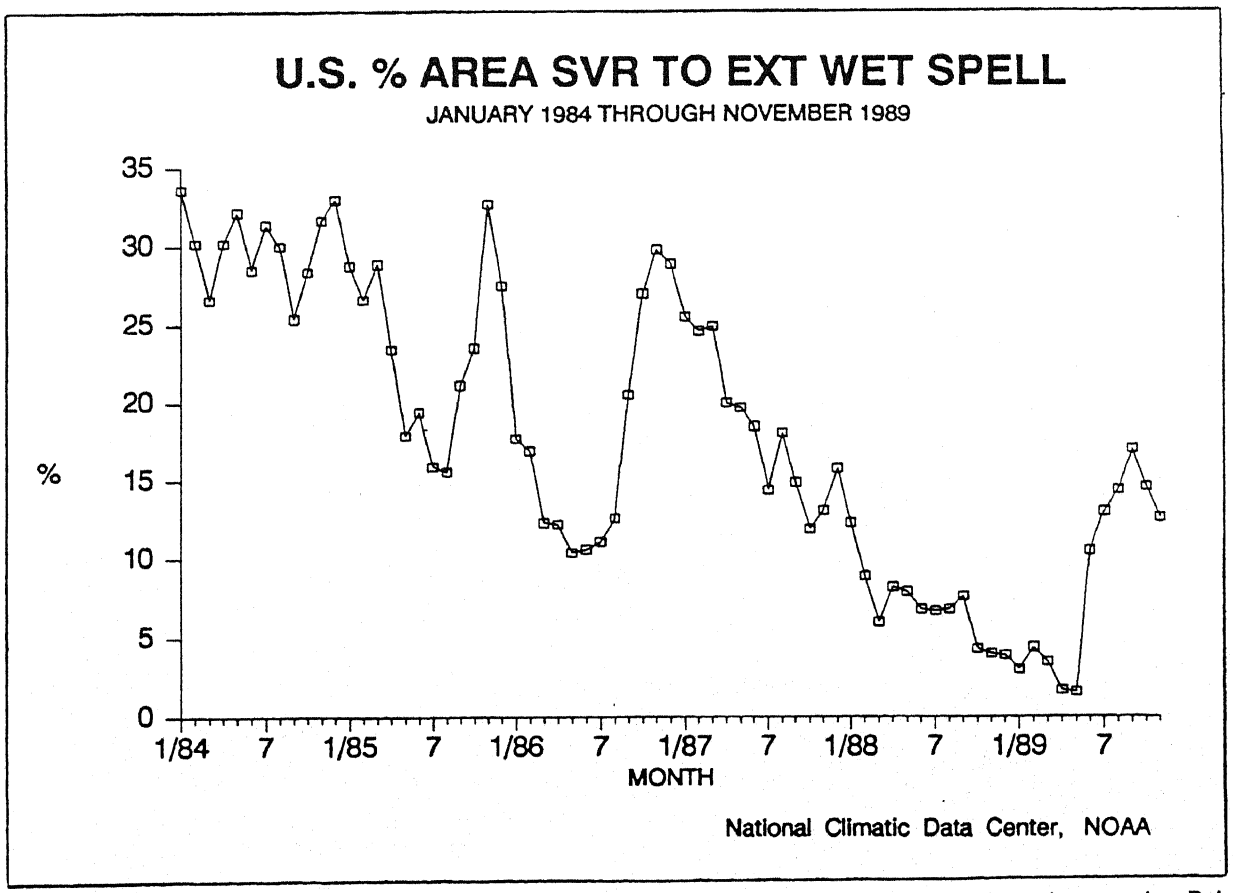


Figure 6. Percent area of the contiguous U.S. with unusually moist (PDI>+3) conditions based upon the Palmer Drought Index (PDI). About an eighth of the lower 48 states remained unusually moist through November, down slightly from last month's value due to a generally dry November in the mid-Atlantic and southern New England.

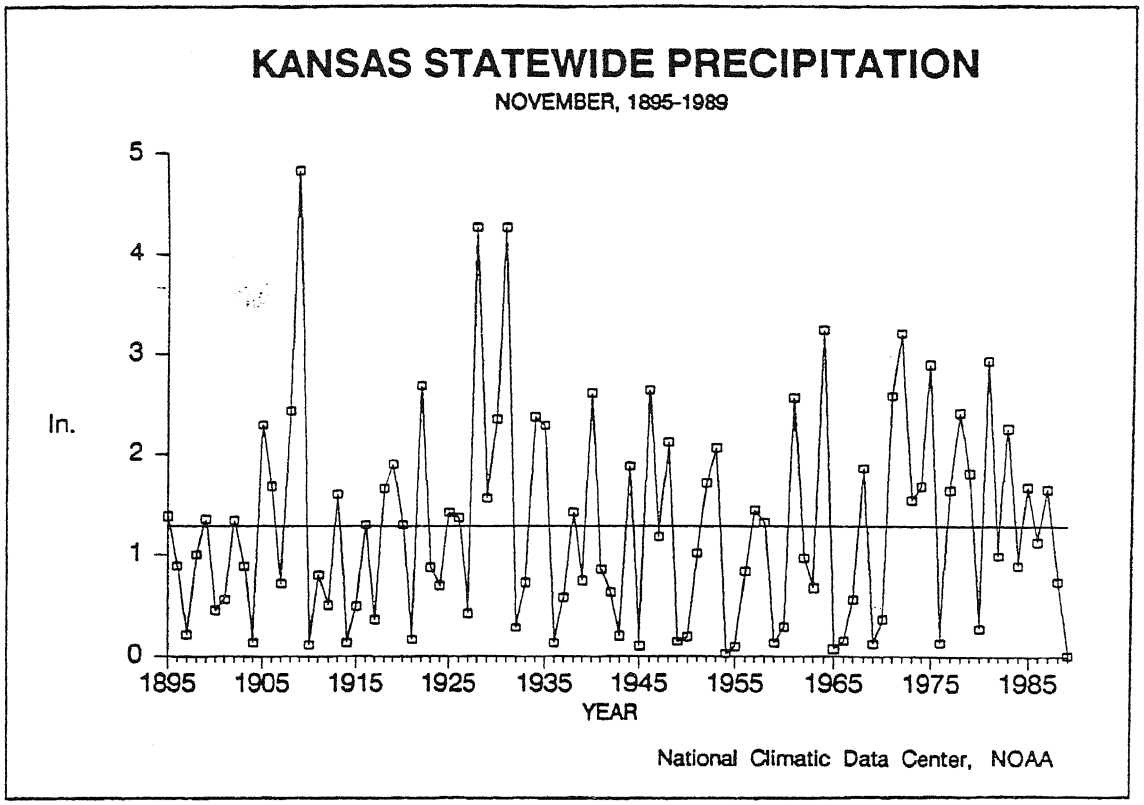


Figure 7. Kansas statewide precipitation for November 1989 from the National Climatic Data Center (NCDC). Most of the state observed no measurable precipitation during the month, making this November the driest November on record (since 1895). Similarly, Nebraska recorded very little November precipitation as the state had its third driest November during the past 95 years. With subnormal October precipitation also occurring in the nation's midsection, both Kansas and Nebraska have observed the sixth and fourth driest October-November periods on record, respectively.

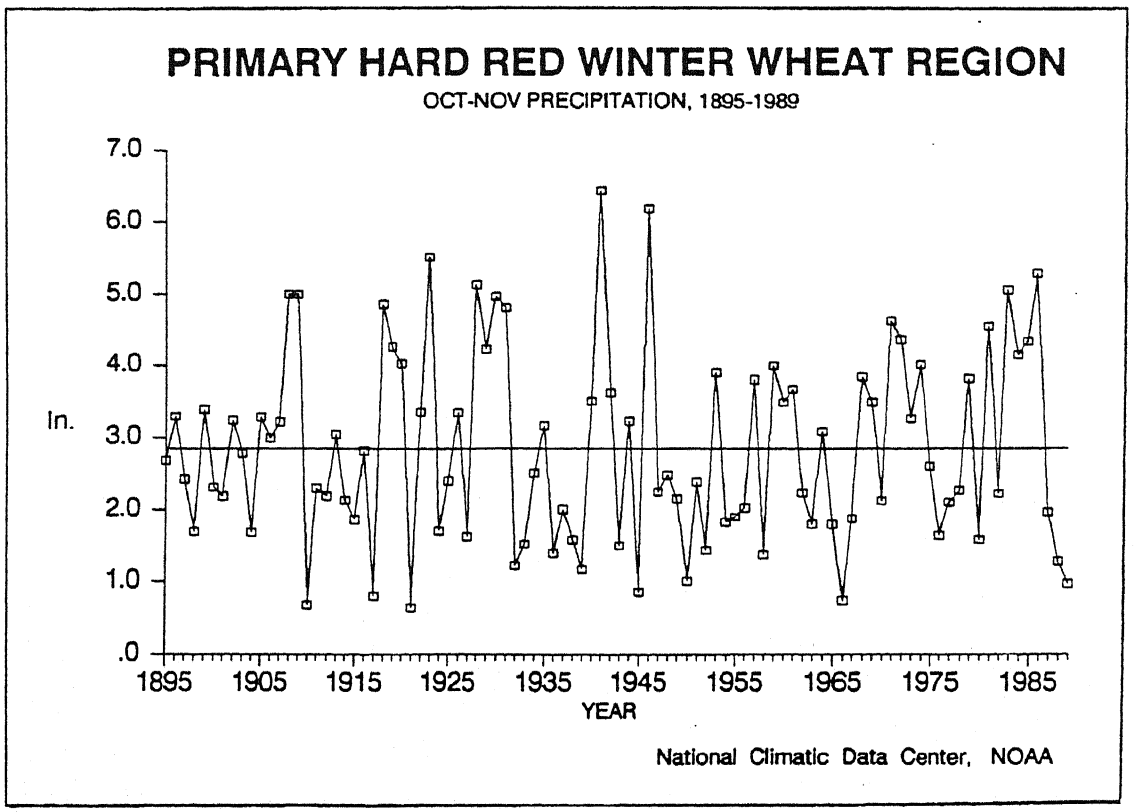


Figure 8. Primary hard red winter wheat region precipitation for October-November 1989 from the NCDC. Although long-term moisture conditions for the hard red winter wheat belt (roughly from southern Nebraska southward into the Texas panhandle) are not very extreme, the last two months have been extraordinarily dry. Precipitation averaged across this region ranked November 1989 as the driest on record, while the last two months are ranked as the sixth driest since 1895.